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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/580,225   | 05/22/2006  | Shin-ichiro Umemura  | 520.46163X00        | 1792             |
| 20457 7590 12/23/2008<br>ANTONELLI, TERRY, STOUT & KRAUS, LLP<br>1300 NORTH SEVENTEENTH STREET<br>SUITE 1800<br>ARLINGTON, VA 22209-3873 |             |                      |                     |                  |
| EXAMINER   |             |                      |                     |                  |
| BRUTUS, JOEL F   |             |                      |                     |                  |
| ART UNIT   |             | PAPER NUMBER         |                     |                  |
| 3768   |             |                      |                     |                  |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/580,225

**Applicant(s)**

UMEMURA ET AL.

**Examiner**

JOEL F. BRUTUS

**Art Unit**

3768

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 May 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SF/ICE)  
Paper No(s)/Mail Date 5/22/2006
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Forestieri et al (US Pat: 5,228,009) in view of Wright et al (US Pat: 5,570,691) and/or Yamazaki et al (US Pat: 5,622,174).

Regarding claims 1-10, Forestieri et al teaches a signal processing apparatus and method for eliminating undesirable clutter signals that is pertinent to the claimed invention. Forestieri et al further teaches in fig 1 a transmitter receiver, color flow processor, Doppler processor, scan converter, control unit, video processor [see fig 1]; wall filters, A/D converter, velocity estimator [see fig 2]; transmitter/receiver circuitry which is typically known as beam former [see column 2 lines 1-15] measuring and imaging blood flow in the human body using Doppler principle wherein a transmitted burst of ultrasound at a specific frequency is reflected from moving blood cells [see column 1 lines 33-39]; color Doppler imaging comprises a probe to send and receive ultrasonic signals, a transmitter/receiver circuitry [see column 1 lines 60-67]; Doppler processor produces a continuous time series of spectral Doppler information in which

blood flow velocities are displayed in black and white on video display over one or more cycles [see column 2 lines 51-56]; RF processor under the control of a control unit processes the signal information to produce a detected and unipolar envelope signal and in phase and quadrature Doppler signals. The envelope signal represents the amplitude of echoes returning from the body [see column 2 lines 15-20].

Forestieri et al also teaches a video processor that a circuit to choose whether a given specific part of the two dimensional image has color information resulting from flow or whether it only has echo information from static tissue [see column 3 lines 15-20]; a final composite two dimensional color image showing blood flow in color overlaid on a black and white image represents the velocity of blood flow in vessels or organs [see column 3 lines 23-26]; velocity of a moving target is expressed as meters/seconds [see column 3 lines 58-62]; high pass filters, spectrum from frequency  $f_2$  to  $f_3$  and very much smaller amplitude [see column 4 lines 1-5]; a velocity estimator, A/D converter [see column 4 lines 36-39]; large signals from stationary or slow moving objects and velocity estimation require many samples to be averaged [see column 4 lines 47-55]; Legendre polynomials [see column 5 lines 45-46]; fig 5 shows spectrum of reflected signals in the form of amplitudes versus time [see fig 5-8]; each data point within a given sample volume shows the motion of that sample volume in the time interval between pulses [see column 7 lines 38-40].

Forestieri et al teaches a multiple of Legendre polynomials whereas an expansion coefficient of an even-numbered degree term and an expansion of an odd-

numbered degree term which is different by one degree and starting from zero, the Legendre polynomials are as follow [see column 8 lines 60-68]:

$$P_0(x) = 1$$

$$P_1(x) = x$$

$$P_2(x) = \frac{1}{2}(3x^2 - 1)$$

$$P_3(x) = \frac{1}{3}(5x^3 - 3x)$$

Forestieri et al further teaches an imaginary unit as a coefficient and complex coefficients [see column 9 lines 29-65, column 10 lines 10-60, column 11 lines 60-68]; imaginary portion and real portion [see fig 9a-b]; fitting linear drift of each waveform with sinusoids that have integer numbers of full cycles [see column 8 lines 16-20].

Forestieri et al doesn't teach a transmission beam former and reception beam former, ratio between magnitudes of each complex expansion coefficient.

However, Wright et al teaches an ultrasound Doppler imaging and transmit beam former and receive beam former [see fig 1 A-B]; Doppler receive beam former [see fig 2A].

Yamazaki et al teaches displaying magnitude of velocity [see column 11], superimpose color velocity image on display [see column 11].

Therefore, it would have been obvious to one with ordinary skill in the art at the time the invention was made to combine these references; for the purpose of routing the ultrasonic beam into a specific or desired areas. Using Legendre polynomial would efficiently remove clutter while minimizing adverse effects to the desired signals. This also has important benefit of requiring less computation time than a power series, thus

improving overall performance and reducing the execution time to determine the frequency estimate for a particular sample volume. Allowing higher frame rates of the ultrasonic imaging apparatus without a loss of quality and sensitivity to lower velocity flows are enhanced.

### ***Conclusion***

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOEL F. BRUTUS whose telephone number is (571)270-3847. The examiner can normally be reached on Mon-Fri 7:30 AM to 5:00 PM (Off alternative Fri).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on (571)272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. F. B./  
Examiner, Art Unit 3768

/Long V Le/  
Supervisory Patent Examiner, Art Unit 3768